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August 24, 2018

Via Electronic Filing

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street SW
Washington, DC 20554

Re: *Request by Google LLC For Waiver of Section 15.255(c)(3) Of the Commission's Rules (ET Dkt. No. 18-70)*

Dear Ms. Dortch:

On August 24, 2018, I discussed the attached presentation with Erin McGrath, Legal Advisor to Commissioner Michael O'Rielly. The presentation reviews previous Google LLC submissions showing that Project Soli technology can reasonably coexist with unlicensed devices at 60 GHz[1] and would not negatively impact remote sensing satellite equipment or radio astronomy operations in the band.[2]

Please do not hesitate to contact me with any questions concerning this filing.

Respectfully submitted,

Megan Anne Stull

Megan Anne Stull
Counsel
Google LLC

cc Erin McGrath

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[1] *See* Google LLC Request for Waiver in ET Docket No. 18-70 (filed Mar. 7, 2018) (attaching Dr. Stefan Mangold, Lovefield Wireless GmbH, *Assessing the Interference of Miniature Radar on Millimeter Wave 60 GHz Wi-Fi* (Feb. 21, 2018)); Reply Comments of Google LLC in Docket 18-70 at 1-2, 5-7 (filed Apr. 23, 2018) (Reply Comments); Letter from Megan Anne Stull, Counsel, Google LLC, to Marlene H. Dortch, Secretary, FCC, in ET Docket No. 18-70 at 1-3 (filed June 8, 2018) (June Ex Parte) (attaching Dr. Stefan Mangold, Lovefield Wireless GmbH, *Assessing the Interference of Miniature Radar on Millimeter Wave 60 GHz Wi-Fi — Supplemental Analysis* (June 8, 2018); Qi Jiang, et al., Google LLC, *Measurement Study on Soli/802.11ad Coexistence* (June 2018)).

[2] Reply Comments at 2-5; June Ex Parte at 4-5 (attaching Dr. Andrew W. Clegg, Google LLC, *Compatibility between Earth Exploration-Satellite Service Sensors and Airborne Use of Project Soli Devices at 57.5 to 63.5 GHz* (June 2018)).

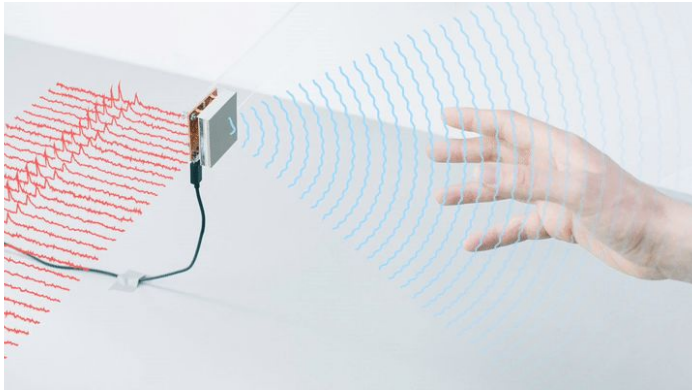
Google

Project Soli Update

August 2018

Gesture Sensing Allows Interaction with Device Functions or Features

Uses radar beam at 57-64 GHz to capture motion in 3D space



Designed for space-constrained, battery-operated devices

Limits on Radars at 60 GHz in the U.S.

Part 15 rules had prohibited/limited mobile field disturbance sensor use since mid-1990s.

Spectrum Frontiers (2016): Use in short-range devices for interactive motion sensing allowed at limits for fixed field disturbance sensors (peak conducted output power −10 dBm; peak EIRP 10 dBm).

FCC Power Levels Reduce Soli Usefulness

Section 15.255(c)(3) power levels too low for user satisfaction

Blind spots
Missed motions
Perceived intermittent operation
Fewer effective interactions

Can't address through design

Shared U.S. & E.U. experience requires higher power levels

Google Seeks To Operate Soli at Higher Powers Allowed in Europe

FCC Communications Devices	FCC Pre-2016 Radars	FCC Post-2016 Radars	ETSI Levels for Short-Range Devices (Requested In Project Soli's FCC Petition for Waiver)
Max Avg. EIRP: +40dBm Max. EIRP: +43dBm	*Mobile radars* Prohibited *Fixed radars* Max. conducted power: −10 dBm Max. EIRP: +10 dBm	Max. conducted power: −10 dBm Max. EIRP: +10 dBm	Max conducted power: +10 dBm Mean PSD EIRP: +13 dBm/MHz Mean EIRP: +20dBm

Waiver Consistent with Longstanding FCC Policy

Innovative new technologies in U.S.

Consistent with FCC intent underlying changes to Rule 15.255(c)(3)

Coexist with other 60 GHz devices

Harmonize FCC rules with global standards

American technical leadership in consumer electronics

No Harmful Effects to EESS and RAS from Airborne Use of Soli

Significant attenuation from inside plane to outside

Mitigating factors such as geometry between passengers and plane windows and satellites, and spatial distribution of planes at altitude, create extremely large interference margins

Unlikely multiple simultaneous use of Soli at low altitudes during landing directly above radio astronomy site

Current EESS sensors protected with 34 dB margin;
future EESS sensors with 22 dB margin
RAS sites also protected

Soli Can Reasonably Coexist With Other 60 GHz Users

60 GHz Wi-Fi only marginally affected
(around 10% throughput reduction & generally far less, if any at all)

Duty cycling makes effects nearly negligible, including in outlier short range scenarios

Results consistent in simulations & lab tests with commercially available equipment